January 13, 1881.

THE PRESIDENT in the Chair.

The Presents received were laid on the table, and thanks ordered for them.

The Hon. Sir George Jessel, Master of the Rolls, was admitted into the Society.

The Right Hon. William Ewart Gladstone, whose certificate had been suspended as required by the Statutes, was balloted for and elected a Fellow of the Society.

The following Papers were read:—

I. "On the 48 Co-ordinates of a Cubic Curve in Space." By WILLIAM SPOTTISWOODE, President R.S. Received December 29, 1880.

(Abstract.)

In a note published in the Report of the British Association for 1878 (Dublin), and in a fuller paper in the "Transactions of the London Mathematical Society," 1879 (vol. x, No. 152), I have given the forms of the eighteen, or the twenty-one (as there explained), co-ordinates of a conic in space, corresponding, so far as correspondence subsists, with the six co-ordinates of a straight line in space. And in the same papers I have established the identical relations between these co-ordinates, whereby the number of independent quantities is reduced to eight, as it should be. In both cases, viz., the straight line and the cubic, the co-ordinates are to be obtained by eliminating the variables in turn from the two equations representing the line or the conic, and are, in fact, the coefficients of the equations resulting from the eliminations.

In the present paper I have followed the same procedure for the case of a cubic curve in space. Such a curve may, as is well known, be regarded as the intersection of two quadric surfaces having a generating line in common; and the result of the elimination of any one of the variables from two quadric equations satisfying this condition is of the third degree. The number of coefficients so arising is $4 \times 10 = 40$; but I have found that these forty quantities may very conveniently be replaced by forty-eight others, which are henceforward considered as the co-ordinates of the cubic curve in space. The relation between the forty and the forty-eight co-ordinates is as follows:—

On examining the equations resulting from the eliminations of the variables, it turns out that they can be rationally transformed into expressions such as $UP'-U'P=0$, where U and U′ are quadrics, and P and P′ linear functions of the variables remaining after the eliminations. The forty-eight co-ordinates then consist of the twenty-four coefficients of the four functions of the form U (say the U-co-ordinates), together with the twenty-four coefficients of the functions of the form U′ (say the U′-co-ordinates), arising from the four eliminations respectively: viz., $4\times 6+4\times 6=48$. And it will be found that the coefficients of the forms P, P′, are already comprised among those of U, U′; so that they do not add to the previous total of forty-eight.

The number of identical relations established in the present paper is thirty-four. But it will be observed that the equations $UP'-U'P=0$ are lineo-linear in the U-co-ordinates and in the U′-co-ordinates; and as we are concerned with the ratios only of the coefficients, and not with their absolute values, we are, in fact, concerned only with the ratios of the U-co-ordinates *inter se*, and of the U′-co-ordinates *inter se*, and not with their absolute values. Hence the number of independent co-ordinates will be reduced to $48-34-2=12$, as it should be.

The thirty-four identical relations arrange themselves firstly in two sets: one set belonging wholly or principally to the U-co-ordinates, and the other set wholly or principally to the U′-co-ordinates. In each set there are four groups: one of four, one of eight, one single, and again one of four equations; seventeen in all. In the course of the paper, the two groups of eight are obtained in two forms: first, by a purely algebraical method in a rational form; and secondly by a method partly geometrical and partly algebraical, in an irrational form.

II. "How do the Colour-blind See the different Colours? Introductory Remarks." By Frithiof Holmgren, Professor of Physiology, University, Upsala. Communicated by W. Pole, Mus. Doc., F.R.S. Received December 6, 1880.

That the colour-blind do not see colours in the same way with normal-eyed persons we may know from the fact that they confuse rays of objective light which, to the normal eye, give quite different impressions.

When, for instance, a red-blind person is confused in his perception of those different sorts of light that to the normal eye appear as red and green, we may conclude that he sees them both as one and the same colour, but not what that colour is, as to its quality—whether it is one of those just mentioned or a third—and whether, on the latter supposition, that colour exists in the colour-system of normal-eyed